NOTES, ABSTRACTS AND REVIEWS.

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NEW DETERMINATIONS OF THE PRECIPITATION OVER THE OCEANS.

By J. VON HANN.

[Abstracted from *Petermann's Mitteilungen*, June, 1920, pp. 126-128.]

While fairly reliable determinations of total precipitation over land areas can be made, such determinations for the oceans must depend upon less direct observations. The means usually employed to arrive at this quantity consist in attributing the difference between the estimated evaporation and the estimated inflow from rivers to precipitation. This assumes, of course, that sea-level remains constant. But different investigators have arrived at widely different results. For example, Brückner, Schmidt, and Lütgens have obtained 1,052 mm., 755.6 mm., and 1,410 mm., respectively, for the value of the annual precipitation.

The wide divergence of these values has led von Kerner to make a new investigation based on the new rainfall maps of the Atlantic and Indian Oceans by Supan, and, while he has reason to believe that his value is somewhat too high, it is in very good accord with that of Brückner, namely, 1,000 mm. A short table of his values for various latitudes is given:

Latitude (°, N. and S.)	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Precipitation (mm.)	1,625	875	525	1,000	1,375	1,050	550

For the whole earth, the ratio of ocean precipitation to land precipitation reaches a maximum in middle latitudes.—*C. L. M.*

ICE IN THE ARCTIC SEAS DURING 1920.

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The Danish Meteorological Institute has published the issue for 1920 of the annual report on the state of the ice in the Arctic seas. The year showed several peculiarities in amount and distribution, although information was lacking from many regions. In the Barents Sea ice was much scarcer than usual, and there was open water as far east as Novaya Zemlya all the summer, while even the Kara Sea offered fewer difficulties than in normal years. On the west coast of Spitzbergen [1] the condition differed little from the normal, but Storfjord was exceptionally free from ice in late summer. There is little information from the east coast of Greenland, but more ice than usual passed around Cape Farewell into Davis Strait. This meant that the ice must have been packed close against the east coast, since the shores of Iceland were practically free from ice throughout the year.

On the Newfoundland Banks icebergs were numerous, and drifted somewhat further south than usual during the first half of the year. In Davis Strait and Melville Bay the ice was more abundant than usual during the spring and early summer.

[1] See "Mild Winter of 1920-21 in Northern Europe," MO. WEATHER REV., Feb., 1921, 49:89.

PRACTICAL APPLICATION OF THE ELECTRICAL-CONDUCTIVITY METHOD OF MEASURING SEA-WATER SALINITY.

By A. L. THURAS.

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Heretofore the only reliable method of measuring the total salt content of sea water has been by chemically titrating for the amount of chlorine present. The relation of chlorine to the total salts being a constant, a measure of the salinity is thereby obtained. Salinity is defined as the number of grams of total salts in 1,000 grams of sea water. The titration method, being a laboratory method, requires that the samples after collection be stored in suitable bottles until they can be tested on shore. The disadvantages of such a method are the loss or breakage of samples, possible errors from evaporation and handling, and the great undesirability of not knowing the physical properties of the waters while they are being investigated.

During the Ice Patrol of 1920 an opportunity was given to use the electrical method of measuring sea-water salinity on board ship. An apparatus consisting of instruments and parts secured from the Bureau of Standards was set up on shipboard and several hundred determinations of salinity were made. The operation of the apparatus was simple and convenient, and at no time did weather conditions interfere with the measurements. This apparatus consisted of a Wheatstone bridge, a Leeds and Northrup alternating-current galvanometer, a specially constructed electrolytic cell designed for a salinity recorder,[1] a hand-regulated temperature bath, and a rebuilt one-twelfth horsepower direct-current motor to give 120 volts, 60 cycles of alternating current when connected to 110 volts direct current. This machine was designed and built by Mr. A. J. Fecht, of the Bureau of Standards.

All measurements were made at 25° C., and a table was prepared to give salinities directly from the balanced bridge readings. The complete apparatus was tested each day by standard sea water taken from a supply which had been carefully measured both by a chemical method and a density method [2] before beginning the cruises. This supply of sea water lasted throughout the cruises. The temperature of the electrolytic cell bath could easily be held to within 0.03° C., and the bridge, after balancing the moving coil of the galvanometer so that the center of mass was fairly near the axis of support, could be set to a value corresponding to 0.02 in salinity. No electrical capacity or inductance was necessary for balancing the bridge, and variations in the voltage and frequency of the generator had no appreciable effect on the bridge setting. With the rough apparatus used the determinations were accurate to 0.05 in salinity, or better than 0.02 of 1 per cent.

Since the electrical conductivity method may be satisfactorily used at sea to measure the salt content of ocean

[1] See *Jour. Wash. Acad. Sciences*, 1918, vol. 8, pp. 145, 680: also "An Electrical Instrument for Recording Sea-Water Salinity," by E. E. Welbel and A. L. Thuras in MO. WEATHER REV., Feb., 1919, 47:105-106.

[2] See *Jour. Wash. Acad. Sciences*, Washington, 1917, vol. 7: 605.